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# Integrating Manipulatives to Improve Fraction Concepts

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## Introduction and Research Questions

With a recent emphasis on meeting the Common Core expectations, using manipulatives to eliminate misconceptions in the mathematical classroom has become even more prevalent. I explored the misconceptions that many students struggle with and provided possible methods of eliminating them at all levels for learning. During this investigation, I studied the effect of manipulatives on students' understanding of fraction concepts and the students' conceptions of the unit of reference when working with fraction word problems.

- *What are students' conceptions of the unit of reference when working with fraction word problems?*
- *Which manipulatives will help increase performance when working with the unit of reference?*

## Significance of Study

- Add to the research already conducted on effective manipulatives in the classroom with a more specific study on the conceptions of the unit of reference
- Learn more about students' conceptions of the unit of reference when working with fraction word problems

## Methods

Mixed-Methods
Pre and Post Assessments
Sample interviews, artifacts from assessments and artifacts from work during lesson interventions
Lesson Intervention: Manipulatives
- Number lines and fraction bars
- Circles
- Combination

## Participants

3rd and 4th grade students
24 Students
Ages 8-10

## Instrument: Assessment

Word Problem Addition
Word Problem Multiplication
Word Problem Sharing Definition
Procedure Addition
Procedure Multiplication
Fraction Identification

*Designed to identify what the participants believe is the unit of reference*

## Intervention

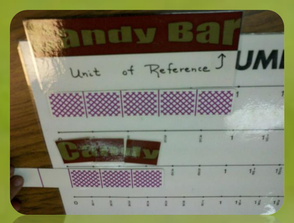
5 Days of Instruction

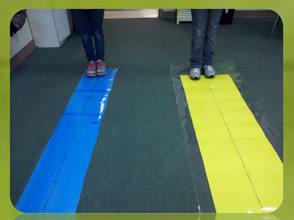
Fraction Identification → Fraction Multiplication

Influence of Word Problems (Critical Thinking)

## Manipulatives

Linear Representation




Circular Representation

## Results

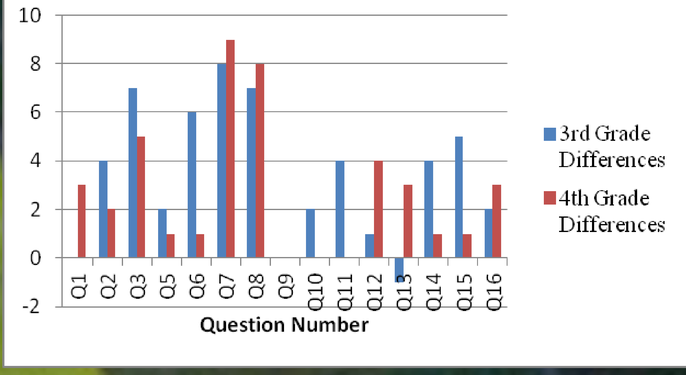
### Quantitative Highlights

Multiplying Fractions: 67% increase

Fraction Identification: 56% for 3rd grade students using circular representation

Sharing Definition: Importance of Circular and Linear

**Figure 1: Overall Student Improvement Per Question**




### Qualitative Highlights

Motivation to use number line floor mat to hop, skip and jump

Many students explained that this was the item that helped them the most with their higher performance

Kinesthetic learning

Students should not be constricted to a specific representation of a word problem

## Discussion

- Manipulatives in the mathematics classroom increase student achievement
- Manipulative use throughout all content areas
- Opens a new door of possibilities for eliminating mathematical misconceptions